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TUBE 6AZh5 (6AG5)

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The Moscow Radio-Apparatus Factory will release a group of new television receivers in 1949. The tube complement of the new receivers will contain several tubes of the 6AZh5 (6AG5) type.

Pentode 6AZh5 is a miniature-type tube Figure 1). General characteristics and special features of tubes of similar design were described in the article "Miniature-Type Tubes," issue No 11 (1948) of "Radio". Tube 6AZh5 has an oxide heater-type cathode and is designed mainly for operation in cascade amplifiers of high-frequency network radio receivers. The short operating characteristic of this tube (sharp cut-off of plate current) makes it difficult to use in an automatic frequency control system.

One of the special construction features of this pentode is that its plate is composed of two rectangular sections connected to each other located on both sides of the cathode. These plate sections are close to the walls of the glass envelope and, therefore, have no shielding whatsoever. These properties must be taken into account in the proper selection of layout and assembly of the tubes and parts of the receiver or amplifier. In individual cases, it may prove necessary to use external shielding of metallic glass. The dimensions of the latter should be as follows: height, 45 mm; inside diameter, 19 mm. Presence of the external shield has an effect on the magnitude of the capacitance between the electrodes. The input and plate-grid capacitance changes insignificantly, while the output capacitance will be noticeably larger than shown in Table 2.

Despite grouping of the plate and control-grid leads in the same socket, the plate-grid capacitance of the tube is not large since these leads are placed diametrically opposite to each other, and besides, on the inside surface of the "button Bottom" there is attached a special shield connected to the cathode. The presence of a metallic tube located in the center of the tube panel and connected to the receiver chassis shields the opposite sockets from each other.

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Limiting Specifications and Parameters

For the 6AZh5 tube certain limiting specifications for voltages on the electrodes and power dissipation have been established (Table 1), on the assumption that the variation in supply voltage does not exceed its nominal value by more than 10 percent.

The basic parameters and optimum performance data for the 6AZh5 tube, utilized as a pentode and triode (screen-grid connected to the plate) in a Class A amplifier circuit, is shown in Table 2.

The characteristics of the 6AZh5 tube are shown in Figure 2 (pentode connection) and Figure 3 (triode connection).

Area of Application

Pentode 6AZh5 has an increased transconductance -- about 5 ma/volt. This makes it suitable for operation with small plate load resistance; as, for example, in a wide-band amplifier in the video channel of a television receiver, and also in a high-frequency amplifier with an untuned plate circuit ("aperiodic" high-frequency amplifier) which appreciably increases the sensitivity of broadcast receivers.

Due to the increased transconductance of the tube characteristic, even with plate load resistance of 2,000 ohms, the cascade amplification obtained is equal to $K = SR_H = 5.10^{-3} \cdot 2{,}000 = 10$, which for a broad-band amplifier (reception of television signals with 625-line definition) must be considered fully satisfactory

The use of short electrode leads, and also the two cathode leads makes the 6AZh5 tube suitable for amplifiers of very high frequency--up to 400 Mcps, which corresponds to a wave length of 75 cm. This tube is also suitable for use in amplifiers for intermediate frequencies, audio channels, and video signals of television receivers without automatic frequency control.

The transconductance of the 6AZh5 pentode is about half as large as that for the 6AC7 pentode which is commonly used for wide-band amplifiers. However, in view of the fact that the sum of the input and output capacitance of tube 6AZh5 is about half as large as that for the 6AC7, its use in wide-band amplifiers is fully satisfactory.

The sharp cutoff of plate current in the 6AZh5 pentode also permits the utilization of these tubes as amplitude limiters in FM receivers, as amplifiers of the synchronizing impulse for the limiter, and also as limiters of the impulse amplitude. Tube 6AZh5 is not suitable for operation in the final stage of the video amplifier due to its low power output.

In connection with the growing need in recent years of increasing the frequency stability of the heterodyne circuit of broadcast receivers, great interest has been aroused in the possibility of utilizing pentode 6AZh5 as a separate heterodyne element. The absence of a hygroscopic plastic socket possessing a high coefficient of thermal capacity is a definite asset of this tube.

[Figures follow.]

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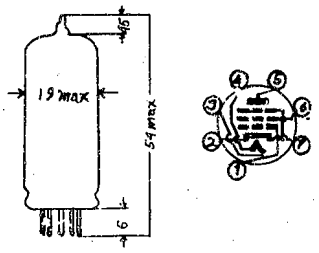

Figure 1

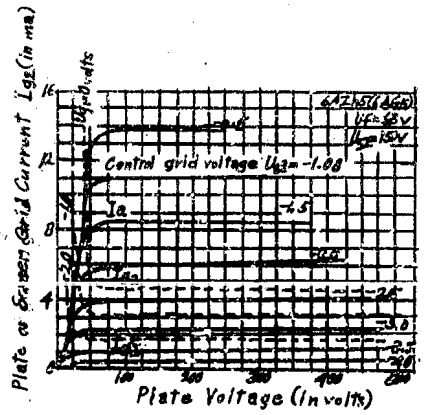

Figure 2

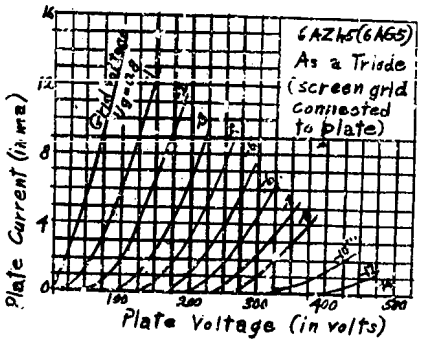

Figure 3

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TABLE 1

Permissible limiting values	Connection	
	Pentode	Triode
Max plate voltage	300	300 volts
Max screen grid voltage	150	—
Max plate dissipation power	2.0	2.5 watts
Max screen grid dissipation power	0.5	—
Max voltage on heater (with respect to the cathode)	100	100 volts

TABLE 2

Name of electrical quantity and parameter	6AZ8 Connection				
	Pentode			Triode	
Class A Amplifier					
Filament voltage	6.3	6.3	6.3	6.3	6.3
Filament current	0.3	0.3	0.3	0.3	0.3
Plate voltage	100	125	250	180	250
Screen grid voltage	100	125	150	—	—
Bias resistor in cathode circuit (ohms)	100	100	200	350	825
Internal resistance (ohms)	300,000	500,000	800,000	7,900	11,000
Transconductance (ma/v)	4.75	5.1	5.0	5.7	3.8
Amplification factor (mu)	1,500	2,500	4,000	45	42
Plate current (ma)	5.5	7.2	7.0	7.0	5.5
Screen grid current (ma)	1.6	2.1	2.0	—	—
Bias voltage on control grid for plate current of 10 ma (volts)	—5	—6	—8	—	—
Inter-electrode capacitance (in mmfd):					
input		6.5		—	—
plate-grid		0.025		—	—
output		1.8		—	—

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